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Quality & Quality Deviation:

It's Regulation under MDB- FIDIC & FPPPAA (2011) Conditions of Contracts & the Applicable Law

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Abstract

Civil Work Construction contracts such as MDB FIDIC 2006 and FPPPAA 2011 contain quite appropriate provisions dealing with defective materials or workmanship. It is important that quality assurance does not cut across those provisions. In other word, quality assurance is not a part of the contract document and it is true in most projects of Ethiopia.

In the absence of Quality Assurance as a part of the Contract Document, if the Contractor or Sub-Contractor complains with a quality assurance system, it means that it is equivalent to compliance with the contract.

However, most of Civil Work Construction Contracts such as MDB-FIDIC 2006 and FPPPAA 2011 included the following concepts behind their legal application on the Contractor's quality assurance requirements whether included or not in the Contract Document:-

a) The Contractor's quality assurance requirements shall not affect in any way the Contractor's other obligations under the contract
b) Compliance by the Contractor with the quality assurance requirements (whether there are included or not) shall not relieve the Contractor in any way from compliance with any of the other requirements of the Contract.

This paper work presents the results of the investigation the relationship between quality and regulations, its consequence of deviation under the MDB- FIDIC 2006, FPPPAA 2011 conditions of contract and the civil code of the country used in the Construction Industry. I have conducted a literature review on quality in construction industry, mainly Defining Quality, Total Quality Management (TQM) and its application in the Construction Industry, Construction Contracts and Legal Liability of the Contractor and discussion part mainly focused on, Defects in works, Taking over of works and its legal Implication and Responsibility of the Engineer in achieving quality.

Among other things, after the literature review and discussion part the case study find outs have been made. The financial loss by the Contractor because of not understanding and implementing quality works especially when quality problem is encountered is huge as there is a continuous increment of cost of construction materials, manpower and fuel. Further, based on the comparison made between the MDB FIDIC and FPPPAA 2011 there must be a compelling clause on quality assurance issues, tests, rectification and default analysis in the conditions of Contract of Ethiopia like FPPPAA 2011 with a similar or better fashion as the MDB-FIDIC conditions of contract. On the other hand, the study also discusses Taking over of works and its legal Implication.

List of Figures/Table

Acronyms/ abbreviations

ASCE - American Society of Civil Engineering

D & C - Design and Construction

DNP - Defects Notification Period

DLP - Defects Liability Period

EBCS - Ethiopian Building Code of Standard

FIDIC - International Federation of Consulting Engineers

ICB - International Competitive Biddings

MDB – FIDIC - Multilateral Development Bank Harmonized International Federation of Consulting

MOUWD - Ministry of Urban and Works Development

FPPPAA - Federal Democratic Republic of Ethiopia Public Procurement & Property Administration Agency

QA - Quality Assurance

NSB - National Standards body

ESA - Ethiopian Standards Agency

QSAE - Quality and Standard Authority of Ethiopia

TQM - Total Quality Management

GCC - General Conditions of contract

SCC - Special Conditions of contract

Chapter One: Introduction

1.1. Background

In construction project quality and quality deviations are always an issue for client, contractor, consultant and regulatory body. This paper tried to analyze the relationship between quality and quality deviation, its consequence during quality deviation how to regulate the issue under the MDB- FIDIC 2006, FPPPAA 2011 conditions of contract and the civil code of the empire of Ethiopia proclamation No. 165 of 1960 used in the Construction Industry. Literature review is carried out and defined broadly the concept of quality and total quality management, the narrow concept of quality as related to construction, type of defects (quality deviations), the concept of patent and latent defect, the contract document in which the quality of the construction works have been specified, quality parameters, procedure for remedy defects and its legal Implication and Responsibility of the Engineer in achieving quality.

This paper has investigated one prototype case study example, the case which focusing on building stair case Defective works. In this case, the cause of the defect, how it is managed by the different stake holders and the opinions of an expert mobilized for this particular event are discussed in detail. Finally, the paper has addressed the proposed remedial measure for the defect and its imposing cost consequence.

1.2. Objectives of the study

The general objective of this paper is to define and discuss quality and quality deviation and how to regulate the quality deviation under the MDB-FIDIC 2006 conditions of contract, FPPPAA 2011 conditions of contract and the applicable law of Ethiopia.

1.3. Methodology

The methodology followed to produce this paper is from both literature review and analysis of a prototype case study example on building construction Defective works. It is also tried to identify the relevant conditions of contract and applicable law for each topic under discussion. In analyzing the prototype case study example, discussion of the relation of the contracting party, their obligation, liability and enforcement for such case of quality deviation are considered.

Finally, a recommendation on mitigation measures not to encounter for such defect works is addressed.

The steps followed to produce this paper are:

1. Define quality
2. Carry out research for relevant materials; e.g. Reference books, reference from internet, interviews with Ethiopian Standard Agency (ESA) and other related Organizations, reviwing new proclamations, rules and regulations about quality & quality control.
3. Evaluate the Material
4. Analyze the Findings
5. Draw Conclusion and Recommendation

Chapter Two: Literature Review

2.1. Introduction

It is clearly known that construction Project to be successful shall meets the requirements of the specification (quality), the contract delivery with schedule and that meet the company's profitable.

Therefore, in construction industry quality is a big concern to be regulated by contract and applicable law. Quality is obtained if the stated requirements are adequate, and if the completed project conforms to the requirements. In the construction industry, quality can be defined as meeting the requirements of the designer, contractor and regulatory agencies as well as the owner. According to the American Society of Civil Engineers (ASCE) study, quality can be characterized as follows:

- Meeting the requirements of the owner as to functional adequacy; completion on time and within budget; lifecycle costs; and operation and maintenance.
- Meeting the requirements of the design professional as to provision of well-defined scope of work; budget to assemble and use a qualified, trained and experienced staff; budget to obtain adequate field information prior to design; provisions for timely decisions by owner and design professional; and contract to perform necessary work at a fair fee with adequate time allowance.
- Meeting the requirements of the construction as to provision of contract plans, specifications, and other documents prepared in sufficient detail to permit the contractor to prepare priced proposal or competitive bid; timely decisions by the owner and design professional on authorization and processing of change orders; fair and timely interpretation of contract requirements from field design and inspection staff; and contract for performance of work on a reasonable schedule which permits a reasonable profit.
- Meeting the requirements of regulatory agencies (the public) as to public safety and health; environmental considerations; protection of public property including utilities; and conformance with applicable laws, regulations, codes and policies.

According to civil code of Ethiopia Art.2031 and Art.2636, Law defines quality in terms of professional liability, a legal concept that requires all professionals to know their trade and practice and its responsibility. Every architect and engineer who offers his or her expertise to owners is subject to professional liability laws.

2.2. Concept of Quality

There are many definitions of quality available in literatures. It is interesting to observe how its definition varies according to the particular emphasis of quality activities. A definition attributed to quality guru Crosby (1979) states the following:

Quality is conformance to requirements.

The preceding definition assumes that the specifications and requirements have already been developed. The next thing to look for is conformance to these requirements. Another frequently used definition comes from

Quality is fitness for use.

This definition stresses the importance of the customer who will use the product.

W. Edwards Deming defined quality as follows:

Good quality means a predictable degree of uniformity and dependability with a quality standard suited to the customer.

The underlying philosophy of all definitions is the same – consistency of conformance and performance, and keeping the customer in mind.

Another definition that is widely accepted is: **Quality is the degree to which performance meets expectations.** This definition provides a means to assess quality using a relative measure.

We provide here the definition adopted by the American Society for Quality (ASQ):

Quality denotes an excellence in goods and services, especially to the degree they conform to requirements and satisfy customers. This definition assimilates the previous.

According to International Organization for Standardization, 1986, ISO 8402, quality is the totality of features and characteristics of a product or service that have a bearing on its ability to satisfy stated or implied needs.

Quality is defined in the construction industry as the fulfillment of project responsibility in the delivery of products and services in a manner that meets or exceeds the stated requirements and expectations of the owner, design professional, and contractor.

The idea of "quality" is simply to meet or exceed the stated requirements, to do so the first time, and to do so in every situation. Quality is a perceptual, conditional and somewhat subjective attribute and may be understood differently by different people.

2.3. Quality Assurance and Quality control

Quality Assurance (QA): This is defined as all those planned and systematic actions necessary to provide confidence that a product or service will satisfy given requirements for quality. Thus QA is concerned to ensure that adequate systems are set up for checking that work is properly done, and that such systems are complied with in practice. It is not a system for providing 'best' or indeed any specific quality of materials and workmanship, but only to ensure that adequate administrative procedures are adopted to see the specified requirements are met. All aspects of the construction process may use QA. Consultants, contractors or suppliers can set up QA procedures covering the whole range of work they have to do, including checking work done against those procedures and arranging for audits to demonstrate compliance. Permanent QA systems may be certified and audited by an independent organization or audits may be required by a promoter. QA has the advantage of requiring people to manage their processes better, but should not be taken as eliminating the need for checking the methods and details of working. Checking that a procedure has been followed does not necessarily mean that the work has been done correctly. Hence, although a construction contractor may run a QA system, it is still necessary for a promoter to be satisfied that the works have been constructed properly; for which independent site.

Quality Control (QC): is the specific implementation of the Quality Assurance program developed and related activities. Effective Quality Control reduces the possibility of changes, mistakes and omissions, which in turn result in fewer conflicts and disputes between the parties involved.

2.4. Total Quality Management in the Construction Process

The manufacturing industry has developed Total Quality Management (TQM) concepts, first applied in Japan, which have increased productivity, decreased product cost and improved product reliability. These concepts are also applicable to the construction industry.

Total Quality Management (TQM) is an effort that involves every organization in the industry in the effort to improve performance. It permeates every aspect of a company and makes quality a strategic objective. TQM is achieved through an integrated effort among personnel at all levels to increase customer satisfaction by continuously improving performance. TQM focuses on process improvement, customer and supplier involvement, teamwork, and training and education in an effort to achieve customer satisfaction, cost effectiveness, **defect-free work**. The process of construction can be broken down in to three main phases, namely,

1) The planning and design phase,
2) The construction phase ,and
3) The maintenance and operation phase. The factors that affect quality in each phase of the construction process have been identified and are discussed in the following sections.

Figure 1: Elements of Total Quality Management

a) Management commitment and leadership

The business roundtable construction industry cost effectiveness study concluded that the primary causes for the decline of construction productivity directly or indirectly involved poor management practices. The success of a TQM program first of all depends on management practices. TQM is a culture and philosophy that must permeate an organization as the method of management.

b) Training

Under TQM, quality becomes everyone's responsibility and the training must be targeted for every level of the company. There should be customized training plans for management, engineers, technicians, home and field office staff, support personnel and field labor.

c) Teamwork

Quality teams provide companies with the structured environment necessary for successfully implementing and continuously applying the TQM process. Quality training is conducted and the continuous improvement process executed through a well planned team structure. The ultimate goal of team approach is to get everyone, including contractors, designers, sub-contractors, and owners involved with the TQM process.

d) Statistical methods

Statistical methods provide problem-solving tools to the TQM process. They provide teams with the tools to identify the causes of quality problems, to communicate in a precise language that can be understood by all team members, to verify, repeat, and reproduce measurements based on data, to determine the past, present, and to lesser degree to, the future status of a work process.

e) Cost of quality

Quality costs consist of the cost of prevention, the cost of appraisal, and the cost of deviation. Prevention costs are those resulting from activities used to avoid deviation or errors, while appraisal costs consists of costs of incurred from activities used to determine whether a product process, or service conforms to established requirements. The cost of design or constructability reviews, as well as the cost of modifying work procedures to adhere to quality standards might be considered prevention costs, while inspection is an example of an appraisal cost.

f) Supplier Involvement

The ability to produce a quality product largely depends on the relationship among the parties involved in the process; the supplier, the processor, and the customer. The quality of any stage in a process is contingent upon the quality of the previous stages. The quality of the project built by the constructor is directly related to the quality of the plans and the specifications prepared by the designer, the quality of the equipment and materials supplied by the vendors and the quality of work performed by the subcontractors. Close and long- term relationships with these suppliers to the construction process are required if the constructor is to achieve the best economy and quality.

g) Customer service

TQM is a process that requires universal involvement to be successful. This includes customer involvement. As more companies become involved in the TQM process and demands for improved quality increase. Customers may be either internal or external. Satisfying the needs of these customers is an essential part of the process supplying the final external customer with a quality product.

2.5. Construction Contracts and Legal Aspects with Respect to Quality Assurance

2.5.1. Purpose of Quality Assurance on Construction Contracts

As defined quality above, the purpose of quality assurance is to ensure conformity and to identify and correct defective design, documentation, manufacture, construction or commissioning. Quality Assurance is a system of self checking. QA is important to identify whether that objective has been achieved. QA will assist in the early correction of problems, before there are adverse consequences or, at least, when it is still possible to minimize the consequences. Thus, QA is important both to risk management and risk reduction. By earlier underlining problems in each of the phases of a project, QA can also assist in better project planning and co-ordination.

2.5.2. Standards in Ethiopia

In Ethiopia there is almost no Quality System Standards for Building Construction Projects. However, in February 2004 GC Former Quality and Standard Authority of Ethiopia (QSAE) published a general overview and as per the latest restructuring as per Ethiopian council of minster regulation No. 193/2010 which cause the splinting of former quality and standards authority of Ethiopia (QSAE) in to four including the new national standard body (NSB):- Ethiopian standard Agency (ESA), Ethiopian Conformity Assessment Enterprise, Ethiopian metrology Institute and Ethiopian accreditation Bureau.

Ethiopian standard Agency (ESA) is a governmental agency which accountable to ministry of science and technology, and as a national standardization of council which work together with the agency, the member of council is drawn from appropriate governmental and other body's and designated by the government.

Ethiopian standard agency has three core business areas which mainly focus on the standard, formulation, training and technical support and organizing and disseminating standards conformity assessment procedures and technical regulation for the customers.

The primary functions of ESA are:

- To lead and coordinate national standardization
- To confirm and publish the national Ethiopian standards
- To promote the implementation of standards.
- To promote Ethiopian standard mark and authorized its used
- To present Ethiopia in the international standards organization and work in collaboration with other foreign national standard bodies
- To establish national enquiry point and deliver services on standardization, conformity assessment guidelines and technical regulations
- To enable Ethiopian industry to benefit from technology transfer by providing technical support, trainings and consultancy service and assisting them in implementation of standards.

2.5.3. Ethiopian Building Code of Standard

In the Proclamation to define the powers and duties of the Central and Regional Executive Organs of the Transitional Government of Ethiopia No. 41/1993 empowers the Ministry of Works and Urban Development to prepare the Country's Building Code, issue Standards for design and construction works, and follow up and supervise the implementation of same.

In exercise of these powers and in discharge of its responsibility, the Ministry is issuing a series of Building Code Standards of general application.

The purpose of these standards is to serve as nationally recognized documents, the application of which is deemed to ensure compliance of buildings with the minimum requirements for design, construction and quality of materials set down by the National Building Code.

The major benefits to be gained in applying these standards are the harmonization of professional practice and the ensuring of appropriate levels of safety, health and economy with due consideration of the objective conditions and needs of the country.

As these standards are technical documents which, by their very nature, require periodic updating, revised editions will be issued by the Ministry from time to time as appropriate.

The Ministry welcomes comments and suggestions on all aspect of the Ethiopian Building Code Standards. All feedback received will be carefully reviewed by professional experts in the field of building construction with a view to possible incorporation of amendments in future editions.

2.5.4. Accountability

Some researches shows that there has been an increasing trend in the industry of construction requirement of each participant in the fragmented design and construction process, from Architects and Engineers to Builders, Contractors, Subcontractors and Suppliers, to be accountable for both the quality and consequences of their work.

In addition, imposing a quality realization and discipline on Quality Assurance and Construction Contracts might also assist identification of responsibility on the contracting parties. Quality Assurance documents might be used subsequently in dispute proceedings to evidence design, manufacture or construction non-conformities. That might be relevant both to breach of contract

and breach of a duty of care. Quality Assurance records might also constitute evidence about the manner in which the QA system has been implemented in conformity or otherwise with QA obligations.

2.5.5. Quality with Respect to Design and Professionals' Liability

In recent years, both public and private sector client have increasingly expected design professionals to meet their contractual and professional responsibilities and have tended to hold them liable in contract or in wrongdoing for negligence for the consequences of their acts, defaults or omissions.

Reflecting this attitudinal change, some researches show design professionals have been treated more as Contractors for the provision of their specialist, professional services, rather than "all care and no responsibility" advisers. Contracts often now imposed upon design professionals are harsher than those developed by their professional associations - which the designers might prefer to use.

The tendency to make design professionals responsible for the times, unfortunate construction consequences of their work, rather than just for defects or failures, has increased design professionals' risk. Liability for construction delay and disruption costs or damages and for variations can be significant.

In tougher economic times there is less financial ability to absorb problems caused by others and a greater need and desire to sheet home responsibility. Those clients who engage separate contract administrators from be designers might be purposely made more aware of construction problems arising from design or documentation.

The design and construction procurement strategy results in a single point responsibility for both design and construction. The D & C contractor is likely to be painfully aware of the manifestation of design/documentation problems in construction. Consonant with many D & C contractors' approach to design professionals as contractors for the provision of services, often subject to tougher contracts then many design professionals would prefer, some D & C contracts expect misbehaving design professionals to take responsibility for any adverse consequences of their work.

Risk management and minimization is essential for design professionals in response to these developments.QA is, perhaps, the greatest risk management tool – after careful selection of quality, key people, and development of clearly delineated objectives and responsibilities and of effective lines of communication.

2.5.5.1. QA-For Design Professionals

Quality Assurance for design and documentation uses

- Monitor the process
- Ensure conformity of design with purpose
- Introduce checks to establish whether design and documentation are correct or require rectification
- Reduce costs and the potential for liability by getting it right the first time or, at least, identifying and correcting non-conformities before construction
- Give comfort to the proprietor that the work is being properly and professionally carried out and checked

2.5.5.2. Required care and responsibility

The standard of care required of design professionals is to exercise due care, skill and diligence. A design professional must bring to the task undertaken the competence and skill usual amongst persons practicing that profession, but the design professional is not required to have an extraordinary degree of skill or the highest professional attainments.

Reinforcing this view on professionals due care as well as contractually liability, the 1960 Civil Code of Ethiopia in his Article 2636 require care and responsibility. Departure from a quality assurance system might be taken as prima facie evidencing negligence, extra contractual liability as per Article 2037 where he fails to discharge his obligation under a contract. Depending upon the terms of the contract, it might also be a breach of a contract.

2.5.6. Breach of Contract Related to Quality Requirements

Non-compliance with a contractually obligatory Quality System would constitute a breach of contract, but damages might or might not flow from that breach-depending upon the consequence of the breach, if any. In practice, defective workmanship might have greater

consequence than any simple non-compliance with a Quality Assurance System. Yet, a failure or refusal to comply with a contractually obligation QA system might lead to a show-cause notice under default provisions and might even constitute repudiator conduct.

2.5.7. Construction Contracts

Civil Work Construction contracts like MDB FIDIC 2006 and FPPPAA 2011 contain quite appropriate provisions dealing with defective materials or workmanship. It is important that quality assurance does not cut across those provisions. In other word, quality assurance is not a part of the contract document and it is true in most projects of Ethiopia.

In the absence of Quality Assurance as a part of the Contract Document, if the Contractor or Sub-Contractor complains with a quality assurance system, it means that it is equivalent to compliance with the contract.

Hence, most of Civil Work Construction Contracts such as MDB-FIDIC 2006 and FPPPAA 2011 included the following concepts behind their legal application on the Contractor's quality assurance requirements whether included or not in the Contract Document.

- The Contractor's quality assurance requirements shall not affect in any way the Contractor's other obligations under the contract.
- Compliance by the Contractor with the quality assurance requirements (whether there are included or not) shall not relieve the Contractor in any way from compliance with any of the other requirements of the Contract.

Construction contract documents define the agreement between the employer and the contractor. Under traditional design-bid-build (DBB) project delivery, the construction contract is a two – party agreement that include the design professional. However the design professional may provide professional services related to construction at the owners direction during construction.

The relationship between Contactor and Employer depends on the quality of the contact documents. It is important that the contract document states clearly roles and responsibilities of the party's with-out over laps or voids and aims squaring at achieving a quality project.

2.5.8. Functions of the Construction Contracts Relating to Quality

The construction contract serves many important functions from the beginning to the end of a project. It defines the rights and responsibilities of the Employer and the Contactor, ranging from the specific quality requirements in the specifications and make decisions and payments in a timely manner. Moreover, the contact documents set forth procedures and requirements for management and administration of the contract, such as schedules, shop drawings, and technical specifications. In this context, the construction contact documents can be considered procedures manual to help ensure quality.

Another important but sometimes overlooked role of the construction contract is that of a planning tool for quality. Various components of the construction contact can be prepared carefully to minimize loop holes occurring during construction period. This could range from specification requirements for materials or workmanship to procedural requirements such as submittals and inspections.

The construction contact documents also support a structured planning process in their role as a risk management plan and risk allocation device. Finally, of course, there is the legal function. Contract rights and responsibilities are enforceable in our legal system. This provides certainly to both parties that the other party will perform in accordance with the terms of the contract, which if prepared with appropriate quality requirements will result in a quality project.

2.5.8.1. Parts of Contract Documents Relating to Quality

There are several separate components to the construction contract documents. Each should be clearly listed in the agreement signed by the parties. These documents supersede any prior or written agreements (Particularly if there is a clause stating this)

According to MDB FIDIC clause 1.5 - Priority of Documents - The documents forming the Contract are to be taken as mutually explanatory of one another. For the purposes of interpretation, the priority of the documents shall be in accordance with the following sequence:

a. The contact agreement(the document signed by the parties, which customarily identifies the parties, states the contract document price, payment terms, and contract time, and lists the contract documents)

b. The Letter of Acceptance,

c. The Tender,

d. The Particular Conditions - Part A,

e. The Particular Conditions - Part B,

f. The General Conditions,

g. The Specification,

h. The Drawings, and

i. The Schedules and any other documents forming part of the Contract.

If an ambiguity or discrepancy is found in the documents, the Engineer shall issue any necessary clarification or instruction.

Because the contract documents are the key to defining quality requirements, it's important to produce quality documents. Successful and cost-effective construction relies upon appropriate communication of a project design by the designer to the Contractor and other project participants. From project conception, through design and construction, to facility management, effective communication of the project requirements depends largely on having complete and coordinated construction documents.

An accurate and complete set of drawings and specifications is the key to providing a client with a construction project that is completed on time and within or under budget.

Among components of construction contact document defining and specifying quality are Technical specification and drawings. Parts of the contact document specifying quality are discussed below:

a) Technical Specification

According to MDB FIDIC-clause 1.1.1.5 "Specification" means the document entitled specification, as included in the Contract, and any additions and modifications to the specification in accordance with the Contract. Such document specifies the Works.

According to FPPPAA 2011 conditions of contract (ICB)-clause 1.2 defines "Specification" means the Specification of the Works included in the Contract drawn up by public body setting out its requirements and/or objectives in respect of the provision of works, specifying, where relevant, the methods and respects to be used and/or results to be achieved.

In general terms, Technical Specification, is a specific description of a particular subject. An engineering specification contains detailed description of all workmanship and materials which are required to complete an engineering project in accordance with its drawings and details. The technical drawings of a structure will show the proportions and relative positions of the various components of the structure. The data regarding the drawings, quality of materials and workmanship is conveyed in a separate contract document which is known as the "specifications" for the work. Thus the drawings with the engineering specifications will completely define the structure. The specification is furnished separately along with the drawings and is an essential part of all construction contracts.

Necessity of Specifications: The necessity of specifications are the following:-

1. The cost of the unit quantity of work is governed by its specification.
2. Specifications of a work are required to describe the quality and quantity of different materials required for a construction work and is one of the essential contract documents. Thus a Contractor can make a program to procure the materials required for a project and the owner can check the quality of materials conforming to the specifications.
3. This also specifies the workmanship and the method of doing work. Thus, specification of a work serves as a guide to the supervising staff of the contractor as well as to the owner to execute the work to their satisfaction.
4. A work is carried out according to its specification and the contractor is paid for the same. Any change in specification tends to change the tendered rate.
5. As the rate of work is based on specification, a contractor can calculate the rates of various items of works in a tender with his procurement rates of materials and labor.
6. Specification is necessary to specify the equipments, tools and plants to be engaged for a work and thus enables to procure them beforehand.

b) Drawings

The other component of construction contact defining quality is drawings. Earlier in our definition of quality, clear requirements should be in place for proper execution of the works under the contract. To make clear the requirements in the technical specifications there must be drawings.

In accordance to MDB FIDIC clause 1.1.1.6 "Drawings" means the drawings of the Works, as included in the Contract, and any additional and modified drawings issued by (or on behalf of) the Employer in accordance with the Contract.

FPPPAA 2011 conditions of contract (ICB)-clause 1.2 defines "drawings" drawings of the Works, as included in the Contract, and any additional and modified drawings issued by (or on behalf of) the Public Body in accordance with the Contract, include calculations and other information provided or approved by the Engineer for the carrying out of the works.

In Ethiopia depend on the complexity, cost of the projects and source of finance, the industry uses different type of Construction Contracts like MOWUD, FPPPAA 2011, FIDIC, HARMONIZED FIDIC etc.

On the following articles this paper will describes legal and contractual aspects of quality assurance and liability on construction works and related to conceptual and real application of the conditions of contract on MDB FIDIC, FPPPAA 2011 and other applicable laws of Ethiopia.

Chapter Three: Discussion

3.1. Quality with respect to MDB-FIDIC

The MDB FIDIC 2006 contains appropriate provisions dealing from Contractor's General Obligation, Quality assurance requirements, providing and using materials, plant & workmanship, tests, up to dealing with defective materials and workmanship.

To illustrate the contractual aspects of quality assurance and liability on construction works and related to conceptual and real application of the conditions of contract we will detail one by one the applicable clauses.

Clause 4.1: Contractor's General Obligation

This clause sets out the Contractor's general obligation to "execute and complete the Works" and "remedy any defects".

This clause is very interrelated with clauses "proceed with the works with due expedition and without delay" At Sub-Clause 8.1 and

"Take full responsibility for the care of the works" At Sub-Clause 17.2.

The works which is expected from this clause will be checked by the Tests on completion and Tests after completion which is carried out under clause 9.

Clause 4.9: Quality Assurance

a. The Contractor shall, if requirements are so stated in the Contract Plan, establish and maintain a quality system which conforms to those requirements;
b. The engineer shall be entitled to audit any aspect of the system.
c. Compliance with the quality assurance system shall not relieve the contractor of any of his duties, obligations or responsibilities under the contract.

Clause 7: Plant, Materials and Workmanship

This clause sets out the Contractor's Obligation concerning the quality of his work and the procedure to be followed for tests and in the event that an item of work fails the test.

Clause 7.1: Manner of Execution and Clause 7.2 Samples

Those clauses states during implementation of the work the contractor manufacture plant, production manufacture material should consider the contract agreement and with good workmanship and carful manner

The contractor shall submit sample of material and relevant document information to the Engineer for consent prior to using material along with the sample cost carried by the contractor unless otherwise it is an additional sample instructed by the engineer treated as variation cost.

Clause 7.3: Inspection

In line with this Clause the Contractor shall give notice to the engineer whenever any work is ready and the engineer tests inspect measure and examine the ready work and forward his decision. However if the contractor fails to give notice, he shall if and when required by the engineer uncover work and thereafter reinstate and make good, the entire work by contractor's own cost

Besides, Employers representative at all reasonable time can access to all part of site and to all places entitled to examine inspect measure and test material and workmanship.

Clause 7.4: Testing

This clause deals with the procedures for tests specified in the contract and additional tests instructed by the Engineer as a variation.

The Contractor will give notice as per the above clause whenever any work is ready or before it is concealed. The Engineer will then give the Contractor not less than 24 hours notice of his intention to attend the tests and the time and place will be agreed between Engineer and Contractor. The Contractor will provide all the apparatus, assistance, documents and other necessary items for the test.

If the engineer wants to change any of the specified details then he must issue a Variation under Clause 13. If the Engineer fails to attend the test, without issuing an appropriate instruction, then the Contractor can proceed. In here if the Contractor suffers any delay he can be entitled to an extension of time and payment of any such cost plus reasonable profit.

After the tests, the Contractor will send to the Engineer a certified report and when the tests have been successful, the Engineer will issue a certificate.

Clause 8.2: Time for Completion

This clause sets out the Contractor is obliged to complete all the work in order to comply with the requirement of Taking Over the works including achieving the passing of the tests on completion within the time completion for the works or section (as the case may be).

Clause 9: Tests on Completion

Clause 9.1: Contractor's obligation

As per the definition of Clause 1.1.3.4 Tests on completion are the tests that are carried out after the works have been completed and before the Engineer will issue the Taking-Over Certificate.

In this clause the Contractor must give before 21 days' notice to the Engineer when he will be ready to carry out the Test on Completion and the tests must be carried out within 14 days after this date, on a date instructed by the Engineer. This clause also includes works or plants which are designed by the contractor should submit the "as-built" documents as per Clause 4.1 especially (d).

From the Engineer it is also expected to make allowances if there is usage of the Employer on the performances or other characteristics of the works.

The Contractor shall submit a certified report of these tests to the Engineer.

Clause 9.2: Delayed Tests

This clause deals with when Tests on Completion are delayed. If the tests are delayed by the Employer then the Contractor should give a notice to the Engineer and has a remedial right of extension of time and cost plus profit. If the delay lasts for more than 14 days then as per Clause 10.3, the Employer is deemed to have taken over the works or section on the date when the Tests on Completion would otherwise have been completed.

If the tests are delayed by the Contractor then the Engineer may give notice for the Contractor to carry out the tests within 21 days or Employer's personnel may proceed with the tests at the Contractor's risk and cost.

3.2. Quality with Respect to FPPPAA 2011 Conditions of Contract

Similarly, MDB FIDIC 2006, in PPPAA 2011 conditions of contract quality test and associated events are assessed. The Contractor shall, with due care and diligence, and in accordance with the provisions of the Contract, design the works to the extent stated in the Contract, and execute, complete and remedy any defects in the works. The Contractor shall provide all control and supervision of the works, personnel, materials, plant, equipment and all other items, whether of a temporary or permanent nature required in and for such design, execution, completion and remedying of any defects, insofar as specified in, or can be reasonably inferred from, the Contract.

Clause 34: General Obligation of Contractor

Sub Clause 34.1 says The Contractor shall, with due care and diligence, and in accordance with the provisions of the Contract, design the works to the extent stated in the Contract, and execute, complete and remedy any defects in the works. The Contractor shall provide all control and supervision of the works, personnel, materials, plant, equipment and all other items, whether of a temporary or permanent nature required in and for such design, execution, completion and remedying of any defects, insofar as specified in, or can be reasonably inferred from, the Contract.

Clause 37: Control and Supervision of the work

Sub Clause 37.1 says The Contractor shall himself control and supervise the works or shall appoint a Contract Manager to do so.

Clause 80: Origin and Quality of Works and Materials

Sub Clause 80.1 All goods purchased under the contract shall have their origin in any eligible source country as defined in the Section 5 of the Bidding Documents.

Sub Clause 80.2 The works, components and materials shall conform to the specifications, drawings, surveys, models, samples, patterns and other requirements in the SCC which shall be held at the disposal of the Public Body or the Engineer for the purposes of identification throughout the period of performance.

Clause 81: Inspection and Testing

Sub Clause 81.2 The Engineer shall be entitled, either by himself or his agent, to inspect, examine, measure and test the components, materials and workmanship, and check the progress of preparation, fabrication or manufacture of anything being prepared, fabricated or manufactured for delivery under the contract in order to establish whether the components, materials and workmanship are of the requisite quality and quantity. This shall take place at the place of manufacture, fabrication, preparation or on the site or at such other places as may be specified in the contract.

Sub Clause 81.3 for the purposes of such tests and inspections, the Contractor shall:

a) provide to the Engineer, temporarily and free of charge, such assistance, test samples, parts, machines, equipment, tools or materials and labor as are normally required for inspection and testing;

b) Agree, with the Engineer, on the time and place for tests;

c) Provide access for the Engineer at all reasonable times to the place where the tests are to be carried out.

Sub clause 81.6 states that Failure to pass test on completion as ; if the Engineer and the Contractor disagree on the test results, each shall give a statement of his views to the other within 15 days after such disagreement arises. The Engineer or the Contractor may require such tests to be repeated on the same terms and conditions or, if either party so requests, by an expert to be selected by common consent. All test reports shall be submitted to the Engineer who shall communicate the results of these tests without delay to the Contractor. The results of the re-testing shall be conclusive. The cost of the re-testing shall be borne by the party whose views are proved wrong by the re-testing.

Clause 85: Tests on Completion

Sub Clause 85.1 The works shall not be accepted until the prescribed verifications and tests have been carried out at the expense of the Contractor. The Contractor shall notify the Engineer of the date on which such verification and tests may commence.

Sub Clause 85.2 Works which do not satisfy the terms and conditions of the Contract, or in the absence of such terms and conditions, which are not carried out in accordance with trade practices in the Federal Democratic Republic of Ethiopia, shall, if required, be demolished and rebuilt by the Contractor or repaired to the satisfaction of the Engineer, otherwise this shall be done as of right after due notice at the expense of the Contractor, by order of the Engineer. The Engineer may also require the demolition and reconstruction by the Contractor, or repair to the satisfaction of the Engineer, under the same conditions of work, in which unacceptable materials have been used, or carried out in the periods of suspension provided for in GCC Clause 20.

3.3. Quality with Respect to the Civil Code

According to the Civil Code of Ethiopia, Art. 3021, Work to be done – 1. Sufficient description.

1. The work to be done may be described by means of a plan, scheme or other document.

2. The contractor shall in such case comply with the indications given in such documents.

According to Civil Code of Ethiopia, Art. 3022, Work to be done – 2. General description

1. Where the work to be done has been described in a general manner, the contract shall be construed in a respective manner as regards the importance of such work.

2. Prior to undertakings a work, the contractor shall, whenever this appears reasonable, satisfy himself that the client agrees to the work to be undertaken.

The statement “The contractor shall in such case comply with the indications given in such documents.” Provides certainly to both parties that the other party will perform in accordance with the terms of the contract, which if prepared with appropriate quality requirements will result in a quality project.

3.4. Defects in quality

Defect experienced in construction are costly and preventable. Current approaches for quality control in construction sites are not as effective as they could be in identifying defects early in the construction process. As a result, defect can go undetected until later phases of construction or event to maintenance phase. Defect, when detected late can have costly rectification.

Any construction fail to meet the minimum requirement which stipulated in the contract document can be said defect in quality. Also defect in quality can also related with the functionality of the work

3.5. Who is Responsible for Defects?

QA applied to manufacture, design and construction will, of course, assist the designer or contractor to achieve the design intent and also uniform standards. That might not seem to directly reduce designers' risk, but it might do so indirectly. Frequently, when disputes arise over quality, builders, contractors and subcontractors assert the cause of the problem lies with the design rather than manufacture, construction or installation - as to so establish would transfer responsibility and liability to the designer(s). Designers are frequently unwilling participants in those disputes.

In the event of major defects, the designers are often take legal action directly as co-defendants, or joined as co-defendants by others such as the Contractor, in either event with it left to the court to determine responsibility and allocate liability amongst them.

It is the interest of the design professionals that this risk be reduced through QA applied to every aspect of project delivery.

Building and Engineering contracts customarily distinguish patent defects and Latent Defects. Whether patent or latent, are equally real and potentially damaging. They are, however, subject to different rules at law which may be expressed in contracts. It is this often causes confusion. The terms latent and patent are opposites.

A Patent Defect: is discoverable and may be open to view, exposed, manifest, evident or obvious.

Figure 2: Example of patent Defect

A Latent Defect: will exist before it is discovered as hidden error in work.

When a latent defect becomes manifest it come to an end to be a latent defect and becomes patent. At the moment a latent defect becomes patent the mechanism under contract for dealing with latent defects are usually relevant. A defect which could be discovered by competent professional inspection whether competently inspected and discovered or not is a patent defect.

Figure 3: Example of Latent Defect

3.6. Defect in MDB -FIDIC

Under the MDB FIDIC Contract there are numerous clauses which is deal with defect from Re-testing, Rejection, how to deal with failure to pass on works during test on completion up to completion of outstanding work and remedying defects.

To illustrate the contractual aspects of defect, their liability and procedure for remedy of defect on construction works and related to conceptual and real application of the conditions of contract we will detail one by one on the applicable clauses.

Clause 7.5: Rejection

If as a result of Clause 7.4 Testing found to be defective or not in accordance to the contract then the Engineer can reject that item under Sub-clause 7.5, but must give reasons for the rejection. However, if the engineer requires to be retested he can do so at same procedures and condition as per clause 7.4.

But the Contractor will bear the cost of all other tests if the work or materials rejected and retested fails.

Clause 7.6: Remedial Work

As per the above cited clauses, if works are not in accordance to the contract, the Engineer may instruct that plan, materials or any other work removed from the site and the item replaced. The Contractor must comply with the instruction within a reasonable time, which may be stated in the instruction.

The engineer may also issue instructions for any work which is required for the safety of the works, which must be carried out immediately. If the Contractor fails, or is unable, to comply with this instruction then the Employer may employ others to carry out the work and claim the costs arising from the failure to the Contractor

Clause 9.3: Re-testing

This clause requires Sub-Clause 7.5 and sets out if “the Works or a Section” has failed to pass the Tests on Completion as per the Sub-Clause 7.5, the Engineer may reject and after the

Contractor at the appointed time makes the defective good the engineer can require a repeat test as per the terms and conditions of the contract.

Clause 9.4: Failure to pass Tests on Completion

This Sub-Clause deals with failure by "the Works or Section" and gives to the Engineer

a) Order further repetition of testes of under sub clause 9.3.
b) If the failure deprives the employer of substantially the whole benefit of the works or section, rejected the works.
c) Issue a taking- over certification, if the employer so requests.

Clause 11.1: Completion of Outstanding Work and Remedying Defects

This Clause set out that at the end of the period, the Works must be in the condition required by the Contract with the exception of *"fair wear and tear"*. At the end of or at the expiry date of the DNP or as soon as practicable thereafter, the Contractor shall (a) complete any work which is outstanding on the date stated in a Taking-Over Certificate, within such reasonable time as is instructed by the Engineer, and(b) execute all work required to remedy defects or damage, as may be notified by(or on behalf of) the Employer on or before the expiry date of the Defects Notification Period for the Works or Section (as the case may be).

Any defect will be notified to the Contractor by the Employer or by his agent.

Clause 11.2: Cost of Remedying Defects

This Clause set out the liability for the cost of the repair or remedying of Defects. All work referred to in sub-paragraph (b) of Sub-Clause 11.1 shall be executed at the risk and cost of the Contractor as long as the following situation are exist a) any design for which the Contractor is responsible, (b) Plant, Materials or workmanship not being in accordance with the Contract, or(c) failure by the Contractor to comply with any other obligation.

However, if the work is not the Contractor's liability then the Contractor must be notified promptly and the Cost to be paid to the Contractor is decided by the Engineer as a Variation using the procedure at Sub-Clause 13.3

Clause 11.3: Extension of Defects Notification Period

This clause states that the duration of the DNP which is stated in the Appendix to tender may be extended under Sub-Clause 11.3. The procedure as per the Clause is if the Employer entitled subject to Sub-Clause 2.5 [*Employer's Claims*] to an extension of the DNP for the Works or a Section if and to the extent that the Works, Section or a major item of Plant (as the case may be, and after taking over) cannot be used for the purposes for which they are intended by reason of a defect or by reason of damage attributable to the Contractor. However, a Defects Notification Period shall not be extended by more than two years.

If the delivery and /or erection of plant and/or Materials were suspended under Sub-Clause 8.8 or Sub-Clause 16.1 then the calendar date of the DNP will be delayed. However, under Sub-Clause 11.3, the Contractor's obligation to repair defects or damaged shall not apply to any defect or damaged that occurs more than two years after the DNP for that Plant and/or Materials would have expired.

Clause 11.4 Failure to Remedy Defects

This Clause set out that if the Contractor fails to remedy any defect or damage within a reasonable time, a date may be fixed by (or on behalf of) the Employer, on or by which the defect or damage is to be remedied. The Contractor shall be given reasonable notice of this date.

If the Contractor fails to remedy the defect or damage by this notified date and thisremedial work was to be executed at the cost of the Contractor under Sub-Clause1.2 [*Cost of Remedying Defects*], the Employer may

- Make other arrangements to carry out the work and claim the cost against the Contractor, under Sub-Clause 2.5 or
- Accept the work including the defect and reduce the Contract Price, under the procedures of Sub-Clause 3.5
- Terminate the Contract as a whole or in respect of the relevant part of the Works

Clause 11.5: Removal of Defective Work

This set out that if the defect or damage cannot be remedied expeditiously on the Site and the Employer gives consent, the Contractor may remove from the Site for the purposes of repair such items of Plant as are defective or damaged. This consent may require the Contractor to increase

the amount of the Performance Security by the full replacement cost of these items, or to provide other appropriate security.

Clause 11.6 Further Tests

This Clause set out that if the work of remedying of any defect or damage may affect the performance of the Works, the Engineer may require the repetition of any of the tests described in the Contract. The requirement shall be made by notice within 28 days after the defect or damage is remedied. These tests shall be carried out in accordance with the terms applicable to the previous tests, except that they shall be carried out at the risk and cost of the Party liable, under Sub-Clause 11.2 [*Cost of Remedying Defects*], for the cost of the remedial work.

Clause 11.8Contractor to Search

This sub -clause set out that if the defect or damage cannot be remedied expeditiously on the Site and the Employer gives consent, the Contractor may remove from the Site for the purposes of repair such items of Plant as are defective or damaged. This consent may require the Contractor to increase the amount of the Performance Security by the full replacement cost of these items, or to provide other appropriate security.

3.7. Defect in FPPPAA 2011

Under the PPA 2011 Contract there are some clauses which is deal with defective from the process of Identifying defects, testing up to correction of the defect parts.

To illustrate the contractual aspects of defect, their liability and procedure for remedy of defect on construction works and related to conceptual and real application of the conditions of contract of PPA 2011, we will detail one by one on the applicable clauses.

Clause 82: Rejection

Sub Clause 82.1 for Components and materials which are not of the specified quality shall be rejected. A special mark may be applied to the rejected components or materials. This shall not be such as to alter them or affect their commercial value. Rejected components and materials shall be removed by the Contractor from the site within a period which the Engineer shall specify, failing which they shall be removed by the Engineer as of right at the expense and risk of the Contractor. Any work incorporating rejected components or materials shall be rejected.

Sub Clause 82.2 the Engineer shall, during the progress of the works and before the works are taken over, have the power to order or decide:

a) the removal from the Site, within such time limits as may be specified in the order, of any components or materials which, in the opinion of the Engineer, are not in accordance with the contract;

b) the substitution of proper and suitable components or materials; or

c) the demolition and proper re-execution, or satisfactory repair, notwithstanding any previous test thereof or interim payment therefore, of any work which, in respect of components, materials, workmanship or design by the Contractor for which he is responsible, is not, in the opinion of the Engineer, in accordance with the Contract

Sub Clause 82.3 the Engineer shall, as soon as reasonably practicable, give to the Contractor notice in writing of his decision specifying particulars of the alleged defects.

Clause 88: Defects Liability

Sub Clause 88.1 The Contractor shall be responsible for making good any defect in, or damage to, any part of the works which may appear or occur during the Defects Liability Period and which arises either from:

a) The use of defective plant or materials or faulty workmanship or design of the Contractor; and/or

b) Any act or omission of the Contractor during the Defects Liability Period.

Sub Clause 88.2 The Contractor shall at his own cost make good the defect or damage as soon as practicable. The Defects Liability Period for all items replaced or renewed shall recommence from the date when the replacement or renewal was made to the satisfaction of the Engineer. If the contract provides for partial acceptance, the Defects Liability Period shall be extended only for the part of the works affected by the replacement or renewal.

Sub Clause 88.3 If any such defect appears or such damage occurs, during the period referred to in GCC Clause 88.1, the Public Body or the Engineer shall notify the Contractor. If the Contractor fails to remedy a defect or damage within the time limit stipulated in the notification, the Public Body may:

a) carry out the works himself, or employ someone else to carry out the works, at the Contractor's risk and cost, in which case the costs incurred by the Public Body shall be deducted from monies due to or from securities held against the Contractor or from both; or

b) Terminate the Contract.

Sub Clause 88.4 If the defect or damage is such that the Public Body has been deprived substantially of the whole or a part of the benefit of the works, the Public Body shall, without prejudice to any other remedy, be entitled to recover all sums paid in respect of the parts of the works concerned together with the cost of dismantling such parts and clearing the Site.

Sub Clause 88.5 In case of emergency, where the Contractor cannot be reached immediately or, having been reached, is unable to take the measures required, the Public Body or the Engineer may have the work carried out at the expense of the Contractor. The Public Body or the Engineer shall as soon as practicable inform the Contractor of the action taken.

Sub Clause 88.6 Where the SCC stipulates that the maintenance work, necessitated by normal wear and tear, shall be carried out by the Contractor, such work shall be paid for from a provisional sum. Deterioration resulting from the circumstances provided for in GCC Clause 44 or from abnormal use shall be excluded from this obligation unless it reveals a fault or defect justifying the request for repair or replacement under GCC Clause 88.

Sub Clause 88.7 The defects liability shall be stipulated in the SCC. If the duration of the Defects Liability Period is not specified, it shall be 365 days. The Defects Liability Period shall commence on the date of provisional acceptance.

Sub Clause 88.8 After provisional acceptance and without prejudice to the defects liability referred to in this GCC Clause, the Contractor shall no longer be responsible for risks which may affect the works and which result from causes not attributable to him. However, the Contractor shall be responsible as from the date of provisional acceptance for the soundness of the construction, as laid down in the Ethiopian law.

Clause 50: Retention monies

Sub Clause 61.1 The sum which shall be retained from interim payments by way of guarantee to meet the Contractor's obligations during the Defects Liability Period, and the detailed rules

governing that guarantee, shall be stipulated in the SCC, provided that it shall, in no case, exceed 10% of the contract price.

Sub Clause 61.2 Subject to the approval of the Public Body, the Contractor may, if he so wishes, substitute, not later than the date fixed for the commencement of the works, these retention sums by a retention guarantee issued in accordance with GCC Clause 58.

Sub Clause 61.3 The sum retained or the retention guarantee shall be released within 45 days of the issuing of the signed final statement of account referred to in GCC Clause 65.

3.8. Defects with Respect to Applicable Laws of Ethiopia

The Civil Code of Empire of Ethiopia proclamation No. 165 of 1960 defined the **'period of the warranty' in his Article 3277 by its - 1. Nature.**

1. The period of warranty is a period during which the administrative authorities have the possibility of controlling the proper performance of the works before their final acceptance.

2. Its duration shall be fixed by the contract.

In Art. 3278 (the period of warranty), 2. Effect.

1. During the period of warranty, the contractor shall maintain the works.

2. He shall be liable for defects and shall repair them when he receives from the administrative authorities a requisition order to their effect.

Art 3282- warranty in respect of defects of construction

1. Unless otherwise provided, the contractor shall be liable to the administrative authorities for the defect of construction of the work during 10 years from the date on which they have entered in to possession of the work.
2. The warranty shall not be due, However, in respect of the defect which were apparent at the time of the final acceptance of the work
3. The warranty shall apply to such defect only as prevent the work from being used for the purpose mentioned in the contract or as render such use more onerous or less profitable.

In general based on the Civil Code Article 3039 (warranty due Contractor) it is expected from the contractor a warranty for its works. As per the mentioned article

1. The contractor shall guarantee during ten years from its delivery the proper execution and the solidity of the work done by him.

2. The contractor is also liable during this period for such loss or deterioration of the work as is due to a defect in its execution or to the nature of the soil on which the work has been done.

3. Any provision shortening the period laid down in sub-art. (1) Or excluding the warranty due by the contractor shall be of no effect.

3.9. Taking Over of the Works and Legal Aspect with Respect to Quality

During taking over of the work we consider the following two major scenarios

i. Substantial completion
ii. Final completion

i. Substantial completion

When the project is said substantially completed the project should fulfill the minimum requirement stated in particular conditions of contract and give service and functionality for the intended purpose. But the serviceability of the project is not expected as final completion.

During substantial completion of the project the Employer shall release half of the retention money to the Contractor and upon request the remaining retention money may be substituted by unconditional bank guarantee accordingly.

ii. Final completion

When any project is said to be finally accepted all outstanding issues should be solved during the defects liability period. The Employer will release the remaining retention money immediately.

3.9.1. Taking over with Respect of MDB FIDIC

Under the MDB FIDIC conditions of Contract there are clauses which deal with taking over of works from the Employer's taking over interims and/or substantial and final acceptance up to Interference with tests on completion.

To illustrate the contractual aspects of Taking Over and their liability and procedure and the related conceptual and real application of the conditions of contract we will detail one by one on the applicable clauses.

Clause 10.1: Employers Taking Over

This clause provides a requirement to be under taken when works are completed in accordance with the Contract. The requirement includes the matters described above on Sub-Clause 8.2 which are passing the Tests on Completion and completing all the works as required by the Contract. According to this clause, it is not necessary to complete "*any minor outstanding work and defects which will not substantially affect the use of the Works or Section for their intended purpose (either until or whilst this work is completed and these defects are remedied"*.

Under this clause the procedures follow by the Employer is:

1. When the Contractor decides that the work is completed, within 14 days of being ready to be taken over, he issues a notice to apply to the Engineer for a Taking Over Certificate.
2. Within 28 days of receiving the Contractor's application, the Engineer must issue the Taking-Over Certificate stating the date when the Works were completed in accordance with the contract or reject the application.

If the Engineer rejects the application, he must give his reasons and specify the work that must be done by the Contractor to enable the Taking-Over Certificate to be issued. The Contractor must then complete this work and issue another notice.

If the Engineer fails either to issue the Taking-Over Certificate or to reject the application within the 28 day period then this clause states that the Taking-over Certificate shall be deemed to have been issued on the last day of the 28 day period, provided that the works are substantially completed in accordance with the contract.

Clause 10.2: Taking Over of Parts of the Works

This clause set out that the Engineer may (after the Employer decided a certain part of the works will be taken over before the reminder of the works) issue a Taking-Over Certificate for any part of the permanent works.

If the Employer uses a part of the works without a Taking-Over Certificate then (a) the part which is used shall be deemed to have been taken over as from the date on which it is used (b) the Contractor shall cease to be liable for the care of such part as from this date, when responsibility shall pass to the Employer and (c) if requested by the Contractor, the Engineer shall issue a Taking-Over Certificate for this part. This clause provides that if the Contractor incurs Cost as a result of the Employer using and or taking over a part of the works, then the Contractor will give notice and proceed as Sub-Clause 20.1 and 3.5. The Contractor could then be entitled to his Cost plus reasonable profit.

This clause also provides that the daily rate for any delay damages will be reduced in proportion to the value of any part of the works for which a Taking-Over Certificate has been issued. This daily rate of delay damages shall only apply under Sub-Clause 8.7 and shall not affect the maximum amount of these damages.

Clause 10.3: Interference with Tests on Completion

In this clause, it is specified that the Works shall be deemed to have been taken over by the Employer if the Contractor is prevented, for more than 14 days, from carrying out the Tests on Completion by a cause for which the Employer is responsible. On this clause the Engineer is required to issue a Taking-Over Certificate for the date on which the tests would have been completed if they had not been delayed by this clause. If the Contractor suffers delay and/or incurs costs as a result of this delay to the Tests on Completion he can give notice under Sub-Clause 10.3 and follow the procedures of Sub-Clause 20.1 and 3.5.

3.9.2. Taking Over with Respect to FPPPAA 2011

Under the FPPPA 2011 Conditions of Contract there are some clauses which are dealing with taking over of works from the procedure of completion, Taking Over up to the requirements to fulfill to submit operating and maintenance manuals.

To illustrate the contractual aspects of Taking Over, their liability and procedure and the related conceptual and real application of the conditions of contract, we will detail one by one on the relevant clauses

Clause 86: Partial Acceptance

Sub Clause 86.1 the Public Body may make use of the various structures, parts of structures or sections of the works forming part of the contract as and when they are completed. Any taking over of the structures, parts of structures or sections of the works by the Public Body shall be preceded by their partial provisional acceptance. However, works may in cases of urgency be taken over prior to acceptance provided an inventory of outstanding work is drawn up by the Engineer and agreed to by the Contractor and the Engineer beforehand. Once the Public Body has taken possession of a structure, a part thereof or section of the works, the Contractor shall no longer be required to make good any damage resulting otherwise than from faulty construction or workmanship.

Sub Clause 86.2 The Engineer may, at the request of the Contractor and if the nature of the works so permits proceeds with partial provisional acceptance, provided that the structures, parts of structures or sections of the works are completed and suited to the use as described in the Contract.

Sub Clause 86.3 In the cases of partial provisional acceptance referred to in GCC Sub-Clauses 86.1 and 86.2 the Defects Liability Period provided for in GCC Clause 88 shall, unless the SCC provide otherwise, run as from the date of such partial provisional acceptance.

Clause 87: Provisional Acceptance

Sub Clause 87.1 the works shall be taken over by the Public Body when they have satisfactorily passed the tests on completion and a certificate of provisional acceptance has been issued or is deemed to have been issued.

Sub Clause 87.2 the Contractor may apply, by notice to the Engineer, for a certificate of provisional acceptance not earlier than 15 days before the works, in the Contractor's opinion, are complete and ready for provisional acceptance. The Engineer shall within 30 days after the receipt of the Contractor's application either

a. issue the certificate of provisional acceptance to the Contractor with a copy to the Public Body stating, where appropriate, his reservations, and, inter alia, the date on which, in his opinion, the works were completed in accordance with the Contract and ready for provisional acceptance; or

b. Reject the application giving his reasons and specifying the action which, in his opinion, is required of the Contractor for the certificate to be issued.

Sub Clause 87.3 If the Engineer fails either to issue the certificate of provisional acceptance or to reject the Contractor's application within the period of 30 days, he shall be deemed to have issued the certificate on the last day of that period. The certificate of provisional acceptance shall not be deemed to be an admission that the works have been completed in every respect. If the works are divided by the contract into sections, the Contractor shall be entitled to apply for separate certificates for each of the sections.

Sub Clause 87.4 upon provisional acceptance of the works, the Contractor shall dismantle and remove temporary structures as well as materials no longer required for use in connection with the performance of the contract. He shall also remove any litter or obstruction and redress any change in the condition of the Site as required by the contract.

Sub Clause 87.5 Immediately after provisional acceptance, the Public Body may make use of all the works as completed.

3.9.3. Taking Over with Respect to Applicable Laws in Ethiopia

The Civil Code of the Empire of Ethiopia proclamation No. 165 of 1960 classified by its nature the acceptance of the Works in to two scenarios. The first one is Provisional Acceptance and the second one is Final Acceptance.

Article 3274-3276 Provisional Acceptances

As per Article 3274, the Provisional Acceptance 1. Nature.

1. A Provisional acceptance is a joint ascertainment of the works made immediately after the completion of the works.
2. A provisional acceptance shall result from the effective taking of possession, where this has been made under reservation.

Further Article 3275 states that 2. Effects of the acceptance should be treated from the point of view of the following points:

1. The PA shall not exonerate the contractor from any defect which may be appear after it is made.

2. It shall amount to a tacit acceptance of modifications which the contractor may have made in the project.
3. It shall mark the beginning of the period of warranty at the expiration of which the final acceptance shall be made.

Article 3279-3281 Final Acceptances

As per article 3279 a Final Acceptance 1 nature.

1. The final acceptance is the act where by the administrative authorities definitively appropriate the works after having ascertained that the contractor his obligations in there in their entirety.
2. It shall be made jointly and a record shall be drawn.

Further Article 3281 states 2 effects. of the acceptance should be treated from the point of view of the following points

1. The FA should release the Contractor from his obligation to maintain the works.
2. The contractor shall be entitled to the payment of the balance of the price and to the reimbursement of the amount retained as guarantee and of the security.

Notwithstanding the above, if the administrative authorities default to accept the works as a final Article 3280 gives the following remedial right to the Contractor.

1. The Contractor may require the Court to ascertain that the works are in a condition to be accepted
2. In such case, the Final Acceptance will be taken place on the expiration of the period of warranty or by the day fix by the court.

3.10. Role of the Engineer on Quality Control

In the MDB FIDIC and PPA 2011 conditions of contracts the Engineer has important role in the administration of the Contract and Quality Control of the project. To see the role of the Engineer on the specified clauses on the literature review, please follow the roles of the Engineer in the next discussion in conjunction with the forgoing discussions. However, before this, overall of the Engineer's duties and Authority according sub-Clause 3.1 should be interrelated to the following points.

1. The Engineer have no authority to amend the Contract
2. The Engineer has no any authority to relieve either party from their obligation and duties
3. Any approval, check, certificate, consent, examination, inspection, instruction, notice, proposal, request, test including absence of disproval given by the Engineer does not relive the Contractor from his obligation.
4. To give a "fair" determination.

3.10.1. Role of the Engineer under MDB- FIDIC Condition of Contract

Clause 4.4: Contractor's General Obligation

- The Engineer has a responsibility to instruct the Contractor to complete the works in accordance to the contract.
- The Engineer has a responsibility to make sure or satisfy himself the Contractor is submitted details of the arrangements and methods on his proposal in the execution.
- The Engineer has a responsibility to give approvals on the Contractor's submission on
    - Design of any part of permanent works
    - "As-Built" documents
    - Operation and Maintenance Manuals

Clause 4.9: Quality Assurance

The Engineer has a responsibility to audit and comment on the Quality Assurance Manual before each design and execution stage commenced by the Contractor or Sub-Contractor.

Clause 7.1: Manner of Execution

The Engineer should satisfy himself whether the Contractor has submitted sample of material and relevant document prior to using the material or plant.

Clause 7.3: Inspection

The Engineer should satisfy himself whether the Contractor gives notice for the works to be tested, inspected, measured and examined. In addition, he has a responsibility to forward his decision on this matter.

Clause 7.4: Testing

- The Engineer has a responsibility to give a less than 24 hours notice of his intention to attend during the testing time.
- The Engineer has a role/power to issue a variation as per Clause 13.

Clause 7.5: Rejection

- The Engineer has a power /role / responsibility
  - To reject
  - To give reasons for the rejection
  - To order for retesting
  - To give determination as per Clause 3.5

Clause 7.6: Remedial Work

- The Engineer has a role to
  - To instruct for removing / replacement of plant, material and other work from the site.
  - Instruct any work for safety.
  - Give determination as per clause 3.5.

Clause 9.1: Contractor's Obligation

- The Engineer has a role or responsibility to make sure himself
  - The tests are made within 14 days from the date of his instruction
  - The Contractor submitted certificate reports of the tests

Clause 9.2: Delayed Tests

- The Engineer has a role or responsibility
  - To give determination of delayed of tests due to default of the Employer
  - To give order to the Contractor in case of default by the Contractor within 21 days

Clause 9.3: Retesting

- The Engineer has a role or responsibility or power
  - To order retesting of tests on completion

- To instruct the Contractor to remove and replace Plant or Material or remove and re-execute other work

Clause 10.1: Taking Over of the Works and Sections

- The Engineer has a role or responsibility or power
  - To issue a Taking Over Certificate within 28 days from the Contractor's notice
  - To specify the dates when works were completed or reject the application
  - To give his reasons and specify for rejection

Clause 10.3: Interference with Tests on Completion

- The Engineer has a role
  - To instruct to the Contractor to finish on a reasonable time
  - To notify to the Contractor to remedy default

Clause 11.2: Cost of Remedying Defects

- The Engineer has a role or responsibility
  - To satisfy himself the remedying of defects
  - To instruct variation in case of the Employer's default

Clause 11.6: Further Testes

The Engineer has a power to instruct repetition of any tests for if any remedying of defect or damage affect the performance of the works

3.10.2. Role of the Engineer under FPPPAA 2011 Condition of Contract

Clause 80: Origin and quality of works and material

- Sub clause 80.2 The Engineer has a responsibility to identify the works, components and materials shall conform to the specifications, drawings, surveys, models, samples, patterns and other requirements
- Sub clause 80.3 The Engineer has a responsibility to make sure or satisfy himself for items which have been rejected, but such materials and items will be accepted for incorporation in the works.

Clause 81: Inspection and testing

Sub clause 81:2 The Engineer shall be entitled, either by himself or his agent, to inspect, examine, measure and test the components, materials and workmanship, and check the progress of preparation, fabrication or manufacture of anything being prepared, fabricated or manufactured for delivery under the contract in order to establish whether the components, materials and workmanship are of the requisite quality and quantity.

Sub clause 81:5 when components and materials have passed the tests referred to in this GCC Clause, the Engineer shall notify the Contractor or endorse the procedure's certificate to that effect.

Clause 82: Rejection

- The Engineer has a power to order or decide
  - Sub clause 82:1(a) The removal from the Site, within such time limits as may be specified in the order, of any components or materials which, in the opinion of the Engineer, are not in accordance with the contract;
  - Sub clause 82:1(b) The substitution of proper and suitable components or materials; or
  - Sub clause 82:1(c) the demolition and proper re-execution, or satisfactory repair, notwithstanding any previous test thereof or interim payment therefore, of any work which, in respect of components, materials, workmanship or design by the Contractor for which he is responsible, is not, in the opinion of the Engineer, in accordance with the Contract.
  - Sub clause 82:3 The Engineer shall, as soon as reasonably practicable, give to the Contractor notice in writing of his decision specifying particulars of the alleged defects.

Clause 85: Test on completion

  - Sub clause 85:2 Works which do not satisfy the terms and conditions of the Contract, or in the absence of such terms and conditions, which are not carried out in accordance with trade practices in the Federal Democratic Republic of Ethiopia, shall, if required, be demolished and rebuilt by the Contractor or repaired to the satisfaction of the Engineer,

Chapter Four: Case Study

4.1. Case Study - 1

Introduction

The Ethiopia Government representing by X Office wants to build G+4 Office Building of Y project at one Region of the country. The status of the building during the execution of the project was at 3rd floor which is constructed in DBB (Design bid build) contract delivery system. Project duration is 365 calendar days with contract amount of 15,678,204.21.

Case: Stair Case Defect

It was observed that after finishing of 3rd floor the stair case was collapsed and due to this event one carpenter was passed away during perform his job.

A forensic investigation of construction was launched to ascertain the causes of the collapse and suggest remedial measures. A number of field investigations and laboratory tests were carried out as part of the investigation studies.

Contractor's Response

After the identification of the problem, the contractor argues that the case of defect is the design used given by the engineer; especially number, size and arrangement of reinforcement bars in the structure (stair case). Submitted his Extension of Time and Time related cost claim as per General Condition of Contract clause 44.1 under the following heads of claim

- Failure of Engineer to give appropriate design for contractor & also timely supervision.
- The contractor ware done according to the drawings given from the engineer.

Supervision Consultant Response

After the receipt of the claim the Engineer reject the contractor claim. However, he also mobilized team of expert for further investigation in consultation with Employer and Contractor.

Expert Team Investigation

As per clearly expressed by the client "Our concern is the Quality of structures on the building", to provide them with the necessary tests conducted by the Supervision Consultant on the quality of the materials, their mix and final results while approving the executed building structures. All the quality test results of sub structure and super structure were analyzed to fulfill the afore-mentioned tasks and also to find out whether failure of the stair case is associated with the poor workmanship and quality control or overload and design. To carry out this task, the entire database has been considered for analysis in the investigation studies.

Substructure

The frequency of the quality control test results has been adhered to as per the requirement of the EBCS-2/1999 technical specification. The summary of the test results are given and the salient points of the results are as follows:

- Bearing capacity of foundation soil is 280MPA.
- Size of Footing pads are designed & constructed more than the permissible amount which is better for the building.
- Foundation columns, grade beam and other structural members of the building except the stair case are at a good condition.

Substructure

The frequency of the quality control test results has been adhered to as per the requirement of the EBCS/1999 technical specification. The summary of the test results are given and the salient points of the results are as follows:

- All site documents show that every activity including the staircase was done with the approval of the engineer and as per the designs, drawings and specifications given for the contractor from the engineer, therefore all structural members of the building except the stair case are at a good condition.

Staircase

All quality control test results to ensure materials and workmanship of the staircase have been done in accordance with the quality control. For the compliance of results, concert mix has been used as per the specified grade of the specification given and standards of EBCS/1999 the salient points of the results are as follows:

- Compressive strength of the concrete in all the tested samples is greater than 28MPA but the specification orders that compressive strength of the concrete should be 25MPA or more.

Concrete mix quality and hydration

All the quality control test results to ensure materials and workmanship of the Concrete have been done in accordance with the quality control.

The summary of the test results and the salient points of the test results are as follows:

- Laboratory tests shows that the concrete mix and hydration of cement are done as specified in the specification.

Quality of Reinforcement bar according to the specification on the contract agreement

- Laboratory tests shows that the reinforcement bars used for all construction were fulfill the minimum requirement specified in the specification.

Specific Observations

Specific observations at each structural element have been noted by observing potential causes of failure, especially history of the staircase. i.e. whether the staircase is subjected to live load and its own weight have been primed, geometric features i.e. number of steps in each flight, size of each step & landing, thickness of soffit, and arrangement of RC bars in a site-specific developed format. A photographic inventory of each part has been done.

With above surveys, the entire project has been divided into following two sections based on structural condition:

- ✓ Substructure
- ✓ Superstructure

Two (02) nos. of investigation have been made at the following two locations:

- ✓ By excavating two opposite corners of the building foundation which is also foundation of the staircase.
- ✓ By taking sample from failed and sustained part of the staircase.

The observations noted during the investigation trench are as follows:

Investigation pit number 1 (Substructure):

a. Excavate two opposite corners of the building foundation up to a depth of 3.5m which is bottom of foundation footing pad.

b. Inspect material used for back fill and also check the compaction, there is well compacted best granular material.

c. Measured the thickness of foundation footing pad which becomes 500mm.

d. Measured the size of foundation footing pad which becomes 2000mmX2000mm.

e. Checked size and number of bars used by chiseling one side of foundation footing pad.

Investigation Number 2 (Superstructure):

- Take concrete sample from crashed concrete of the staircase for laboratory test.
- Take reinforcement bar sample from crashed concrete of the staircase for laboratory test.
- Investigate number of R.C bars used for the staircase, which is ϕ8mm placed at 20mm c/c both sides similar with the working drawing.
- Thickness of soffit is 17mm.

Fig. 4 Illustration of Actual Failure

Expert Team results

After finalization of detail investigation Expert team forward the following cases are main reason for the defect

- The error of working drawing given for the contractor. Which should be ϕ14mm placed at 18mm c/c as the expertise team does structural analysis as well as the engineer done during the analysis but not indicated properly on the drawing..

Remedial Measures Proposed by expert team

Collapsed staircase

The entire project has been divided into two sections based on structural condition. These are as given below:

- ✓ Substructure

- ✓ Superstructure

Two (02) nos. of investigation have been made at the following two locations:

- ✓ By excavating two opposite corners of the building foundation which is also foundation of the staircase.
- ✓ By taking sample from failed and sustained part of the staircase.

SUBSTRUCTURE

Physical Condition: The Physical condition of this section has already been constructed without any error and then it is structurally sound.

SUPERSTRUCTURE

Physical Condition: The Physical condition of this section is described in the following paragraphs.

(a) The flight and landing is collapsed totally then should be reconstructed using corrected design that is by using 14mm dia. R.C bar at 17mm c/c both sides and 17mm soffit thickness.

(b) The column of the staircase is collapsed by buckling. Then should be reconstructed using corrected design by using 16mm dia. R.C bar at 17mm c/c both sides and 17mm soffit thickness.

Liability of the above remedial work is the engineer for design & employer for construction.

Conclusion: Based on the above details, it is inferred that there is a specific problem only in the staircase and it can be permanently rectified by reconstructing using proper material specified in the corrected design.

Also during construction, the rework shall be ensured for continuity of the structure with the unclasped strong part of the building and 100% supervised by the Engineer and also quality tests as per original materials requirements shall be carried out.

Chapter Five: Comparison table

5.1. Comparison between MDB-FIDIC and FPPPAA 2011 Conditions of Contract on Quality and Quality Deviation

I. No	Des.	Provision of MDB-FIDIC Conditions	Provision of FPPPAA 2011 Conditions	Remarks
1		**Clause 4.1 (Contractor's General Obligation)** This clause sets out the Contractor's general obligation to "execute and complete the Works" and "remedy any defects", and "take full responsibility for the care of the works" at Sub-Clause 17.2 in addition the Employer requires in this clause the Contractor to carry out the design of part of the permanent works then the requirement must be specified in the contract. Some performance design of standard also stated in this clause at c as 'be fit for such purposes for which the part is intended as specified in the Contract". The works which is expected from this clause will be checked by the Tests on completion and Tests after completion which is carried out under clause 9.	**Clause 34.1: General Obligation of Contractor** This clause sets out the Contractor shall, with due care and diligence, and in accordance with the provisions of the Contract, design the works to the extent stated in the Contract, and execute, complete and remedy any defects in the works. The Contractor shall provide all control and supervision of the works, personnel, materials, plant, equipment and all other items, whether of a temporary or permanent nature required in and for such design, execution, completion and remedying of any defects, insofar as specified in, or can be reasonably inferred from, the Contract.	
2		**Clause 4.9 Quality Assurance** The Contractor shall, if requirements are so stated in the contract plan, establish and maintain a quality system which confirms to those requirements. Any such quality system shall be used only as an aid to achieving		

		compliance with the Contract and to document such compliance. Such system shall not relieve the Contractor of the responsibility to comply with the Contract		
3		**Clause 7: Plant, Materials and Workmanship** This clause sets out the Contractor's Obligation concerning the quality of his work and the procedure to be followed for tests and in the event that an item of work fails the test. Clause 7.1 Manner of Execution All manufacture of plant, the production and manufacture of materials and all other execution of the works should be in accordance of "Proper workmanlike and careful", "recognized good practice" and "properly equipped facilities". Clause 7.2 Samples The Contractor will supply samples such as "manufactures standard samples of material and additional samples instructed by the engineer as a variation" at his own cost and the employer if it is a variation if such supply is envisaged by the contract. Clause 7.3 Inspection This clause set out the Contractor's obligation to allow the Employer's personnel (Engineer) to enter the site and any factories, quarries or other places where work is being carried out for the works to check the progress of manufacture plant and production and manufacture of materials. The contractor must provide 'access facilities, permissions and	**Clause 80:Orgion and quality of works and Materials** This clause sets out the Contractor's Obligation concerning the quality of his work and the procedure to be followed for tests and in the event that an item of work fails the test. Under sub clause 80.2 The works, components and materials shall conform to the specifications, drawings, surveys, models, samples, patterns and other requirements in the contract. And also Under sub clause 80.4 Even if materials or items to be incorporated in the works or in the manufacture of components have been technically accepted. Under clause 81 **inspection and test** sub clause of 81.2 states that The Engineer shall be entitled, either by himself or his agent, to inspect, examine, measure and test the components, materials and workmanship, and check the progress of preparation, fabrication or manufacture of anything being prepared, fabricated or manufactured for delivery under the contract in	In PPA sampling is not stated according to MDB-FIDIC

		safety equipment' to enable the person concerned to inspect and check the materials, workmanship and progress The Contractor is required to give notice when any work is ready for inspection and before it is concealed in any way. Clause 7.4 Testing This clause deals with the procedures for tests specified in the contract and additional tests instructed by the Engineer as a variation. Clause 7.5 Rejection If as a result of Clause 7.4 Testing found to be defective or not in accordance to the contract then the Engineer can reject that item under Sub-clause 7.5, but must give reasons for the rejection. However, if the engineer requires to be retested he can do so at same procedures and condition as per clause 7.4. Clause 7.6 Remedial Work As per the above clauses 7.4 and 7.5, if are not in accordance to the contract, the Engineer may instruct that plan, materials or any other work removed from the site and the item replaced. The Contractor must comply with the instruction within a reasonable time, which may be stated in the instruction.	order to establish whether the components, materials and workmanship are of the requisite quality and quantity Under clause 82 **Rejection** sub clause of 82.1states that Components and materials which are not of the specified quality shall be rejected A special mark may be applied to the rejected components or materials. This shall not be such as to alter them or affect their commercial value. Rejected components and materials shall be removed by the Contractor from the site within a period which the Engineer shall specify, failing which they shall be removed by the Engineer as of right at the expense and risk of the Contractor. Any work incorporating rejected components or materials shall be rejected. And under sub clause 82.3 The Engineer shall, as soon as reasonably practicable, give to the Contractor notice in writing of his decision specifying particulars of the alleged defects.	
4		**<u>Clause 8.2 Time for Completion</u>** This clause sets out the Contractor is obliged to complete all the work in order to comply		

		with the required of Taking Over the works including achieving the passing of the tests on completion within the time completion for the works or section (as the case may be).		
5	5.1	**Clause 9 Tests on Completion** ***Clause 9.1 Tests on Completion*** As per the definition of Clause 1.1.3.4 Tests on completion are the tests that are carried out after the works have been completed and before the Engineer will issue the Taking-Over Certificate. In this clause the Contractor must give before 21 days' notice to the Engineer when he will be ready to carry out the Test on Completion and the tests must be carried out within 14 days after this date, on a date instructed by the Engineer. This clause also includes works or plants which are designed by the contractor should submit the documents as per the Clause 4.1 especially (d) From the Engineer it also expected to make allowances if there is usage of the Employer on the performances or other characteristics of the works. The Contractor shall submit a certified report of these tests to the Engineer	**Clause 85 Tests on Completion** **Sub clause 85.1** states that the works shall not be accepted until the prescribed verifications and tests have been carried out at the expense of the Contractor. The Contractor shall notify the Engineer of the date on which such verification and tests may commence. And also under **sub clause 85.2** Works which do not satisfy the terms and conditions of the Contract, or in the absence of such terms and conditions, which are not carried out in accordance with trade practices in the Federal Democratic Republic of Ethiopia, shall, if required, be demolished and rebuilt by the Contractor or repaired to the satisfaction of the Engineer,	
	5.2	***Clause 9.2Delayed Tests*** This clause deals with when Tests on Completion are delayed. If the tests are delayed by the Employer then the Contractor should give a notice to the Engineer and has a		

		remedial right of extension time and cost plus profit. If the delay lasts for more than 14 days then as per Clause 10.3, the Employer is deemed to have taken over the works or section on the date when the Tests on Completion would otherwise have been completed. If the tests are delayed by the Contractor then the Engineer may give notice for the Contractor to carry out the tests within 21 days or Employer's personnel may proceed with the tests at the Contractor's risk and cost.		
	5.3	***Clause 9.3 Re-testing*** This clause requires Sub-Clause 7.5 and sets out if "the Works or a Section" has failed to pass the Tests on Completion as per the Sub-Clause 7.5, the Engineer may reject and after the Contractor at the appointed time make the defecates good the engineer can require a repeat test as per the terms and conditions of the contract. Clause 9.4 Failure to pass Tests on Completion This Sub-Clause deals with failure by "the Works or Section". And gives to the Engineer (a) to order retesting of Tests on Completion (b) and (c) to instruct the Contractor to remove and replace plant or material or remove and re-execute other work. If the Contractor fails to carry out this instruction then the Employer is entitled to arrange for other persons to carry out the work and claim the Costs under Sub-Clause 11.4 (c)	**Sub Clause 81.6 Re-testing** If the Engineer and the Contractor disagree on the test results, each shall give a statement of his views to the other within 15 days after such disagreement arises. The Engineer or the Contractor may require such tests to be repeated on the same terms and conditions or, if either party so requests, by an expert to be selected by common consent. All test reports shall be submitted to the Engineer who shall communicate the results of these tests without delay to the Contractor. The results of the re-testing shall be conclusive. The cost of the re-testing shall be borne by the party whose views are proved wrong by the re-testing.	

6	6.1	**Clause 10 Employers Taking Over** ***Clause 10.1 Employers Taking Over*** This clause provides a requirement to be taken over when completed in accordance with the Contract. The requirement includes the matters described above on Sub-Clause 8.2 which are passing the Tests on Completion and completing all the work as required by the Contract. According to this clause, it is not necessary to complete "*any minor outstanding work and defects which will not substantially affect the use of the Works or Section for their intended purpose (either until or whilst this work is completed and these defects are remedied"* the Contractor decides that the work is within 14 days of being ready to be taken over, he issues a notice to apply to the Engineer for a Taking Over Certificate. 2. Within 28 days of receiving the Contractors' application the Engineer must issue the Taking-Over Certificate stating the date when the Works were completed in accordance with the contract or reject the application. If the Engineer rejects the application he must give his reasons and specify the work that must be done by the Contractor to enable the Taking-Over Certificate to be issued. The Contractor must then complete this work and issue another notice. Under this clause the procedures follow by the Employer is 1. When If the Engineer fails either to issue the Taking-	**Clause 87 Provisional acceptance** Under sub clause 87.1 states that the works shall be taken over by the Public Body when they have satisfactorily passed the tests on completion and a certificate of provisional acceptance has been issued or is deemed to have been issued. Under sub clause 87.2 states that the Contractor may apply, by notice to the Engineer, for a certificate of provisional acceptance not earlier than 15 days before the works, in the Contractor's opinion, are complete and ready for provisional acceptance. The Engineer shall within 30 days after the receipt of the Contractor's application either: a). issue the certificate of provisional acceptance to the Contractor with a copy to the Public Body stating, where appropriate, his reservations, and, inter alia, the date on which, in his opinion, the works were completed in accordance with the Contract and ready for provisional acceptance; or b). reject the application giving his reasons and specifying the action which, in his opinion, is required of the Contractor for the certificate to	

		Over Certificate or to reject the application within the 28 day period then this clause states that the Taking-over Certificate shall be deemed to have been issued on the last day of the 28 day period, provided that the works are substantially completed in accordance with the contract. ***Clause 10.2 Taking Over of Parts of the Works*** This clause set out that the Engineer may (after the Employer decided a certain part of the works will be taken over before the reminder of the works) issue a Taking-Over Certificate for any part of the permanent works. If the Employer uses a part of the works without a Taking-Over Certificate then (a) the part which is used shall be deemed to have been taken over as from the date on which it is used (b) the Contractor shall cease to be liable for the care of such part as from this date, when responsibility shall pass to the Employer and (c) if requested by the Contractor, the Engineer shall issue a Taking-Over Certificate for this part This clause provides that if the Contractor incurs Cost as a result of the Employer using and or taking over a part of the works then the Contractor will give notice and proceed as Sub-Clause 20.1 and 3.5. The Contractor could then be entitled to his Cost plus reasonable profit. This clause also provides that the daily rate	be issued. Under sub clause 87.3 states that if the Engineer fails either to issue the certificate of provisional acceptance or to reject the Contractor's application within the period of 30 days, he shall be deemed to have issued the certificate on the last day of that period. The certificate of provisional acceptance shall not be deemed to be an admission that the works have been completed in every respect. If the works are divided by the contract into sections, the Contractor shall be entitled to apply for separate certificates for each of the sections. Under sub clause 87.4 states that Upon provisional acceptance of the works, the Contractor shall dismantle and remove temporary structures as well as materials no longer required for use in connection with the performance of the contract. He shall also remove any litter or obstruction and redress any change in the condition of the Site as required by the contract. Under sub clause 87.5 states that Immediately after provisional acceptance, the Public Body may make use of all the works as	

		for any delay damages will be reduced in proportion to the value of any part of the works for which a Taking-Over Certificate has been issued. This daily rate of delay damages shall only apply under Sub-Clause 8.7 and shall not affect the maximum amount of these damages. ***Clause 10.3 Interference with Tests on Completion*** On this clause it is specified that the Works shall be deemed to have been taken over by the Employer if the Contractor is prevented, for more than 14 days, from carrying out the Tests on Completion by a cause for which the Employer is responsible. On this clause the Engineer is required to issue a Taking-Over Certificate for the date on which the tests would have been completed if they had not been delayed by this clause. If the Contractor suffers delay and/or incurs costs as a result of this delay to the Tests On Completion he can give notice under Sub-Clause 10.3 and follow the procedures of Sub-Clause 20.1 and 3.5	completed.	
7		**Clause 11 Defects Liability** ***Clause 11.1 Completion of Outstanding Work and Remedying Defects*** This Clause set out that at the end of the period, the Works must be in the condition required by the Contract with the exception of *"fair wear and tear"*. At the end of or at the expiry date of the DNP or as soon as practicable thereafter, the Contractor shall (a)	**Clause 88 Defects Liability** Under sub clause 88.1 states that The Contractor shall be responsible for making good any defect in, or damage to, any part of the works which may appear or occur during the Defects Liability Period and which arises either from: a) the use of defective plant or	

		complete any work which is outstanding on the date stated in a Taking-Over Certificate, within such reasonable time as is instructed by the Engineer, and (b) execute all work required to remedy defects or damage, as may be notified by (or on behalf of) the Employer on or before the expiry date of the Defects Notification Period for the Works or Section (as the case may be). Any defect will be notified to the Contractor by the Employer or by his agent. ***Clause 11.2 Cost of Remedying Defects*** This Clause set out the liability for the cost of the repair or remedying of Defects. All work referred to in sub-paragraph (b) of Sub-Clause 11.1 shall be executed at the risk and cost of the Contractor as long as the following situation are exist a) any design for which the Contractor is responsible, (b) Plant, Materials or workmanship not being in accordance with the Contract, or (c) failure by the Contractor to comply with any other obligation. However, if the work is not the Contractor's liability then the Contractor must be notified promptly and the Cost to be paid to the Contractor is decided by the Engineer as a Variation using the procedure at Sub-Clause 13.3 ***Clause 11.3 Extension of Defects Notification Period*** This clause states that the duration of the DNP which is stated in the Appendix to Tender may be extended under Sub-Clause 11.3. The	materials or faulty workmanship or design of the Contractor; and/or b) Any act or omission of the Contractor during the Defects Liability Period. Under sub clause 88.6 states that Where the SCC stipulates that the maintenance work, necessitated by normal *wear and tear*, shall be carried out by the Contractor; such work shall be paid for from a provisional sum. Deterioration resulting from the circumstances provided for in GCC Clause 44 or from abnormal use shall be excluded from this obligation unless it reveals a fault or defect justifying the request for repair or replacement under GCC Clause 88. **Cost of Remedying Defects** Under sub clause 88.2 states that The Contractor shall at his own cost make good the defect or damage as soon as practicable. The Defects Liability Period for all items replaced or renewed shall recommence from the date when the replacement or renewal was made to the satisfaction of the Engineer. If the contract provides for partial acceptance, the Defects Liability Period shall be extended only for the	

		procedure as per the Clause is if the Employer entitled subject to Sub-Clause 2.5 [*Employer's Claims*] to an extension of the DNP for the Works or a Section if and to the extent that the Works, Section or a major item of Plant (as the case may be, and after taking over) cannot be used for the purposes for which they are intended by reason of a defect or by reason of damage attributable to the Contractor. However, a Defects Notification Period shall not be extended by more than two years. If the delivery and /or erection of plant and/or Materials were suspended under Sub-Clause 8.8 or Sub-Clause 16.1 then the calendar date of the DNP will be delayed. However, under Sub-Clause 11.3, the Contractor's obligation to repair defects or damaged shall not apply to any defect or damaged that occurs more than two years after the DNP for that Plant and/or Materials would have expired. ***Clause 11.4 Failure to Remedy Defects*** This Clause set out that if the Contractor fails to remedy any defect or damage within a reasonable time, a date may be fixed by (or on behalf of) the Employer, on or by which the defect or damage is to be remedied. The Contractor shall be given reasonable notice of this date. If the Contractor fails to remedy the defect or damage by this notified date and this remedial work was to be executed at the cost of the Contractor under Sub-Clause 1.2 [*Cost of Remedying Defects*], the Employer may	part of the works affected by the replacement or renewal. **Failure to Remedy Defects** Under sub clause 88.3 states that if any such defect appears or such damage occurs, during the period referred to in GCC Clause 88.1, the Public Body or the Engineer shall notify the Contractor. If the Contractor fails to remedy a defect or damage within the time limit stipulated in the notification, the Public Body may: a) Carry out the works himself, or employ someone else to carry out the works, at the Contractor's risk and cost, in which case the costs incurred by the Public Body shall be deducted from monies due to or from securities held against the Contractor or from both; or b) Terminate the Contract. Under sub clause 88.7 the defects liability shall be stipulated in the SCC. If the duration of the Defects Liability Period is not specified, it shall be 365 days. The Defects Liability Period shall commence on the date of provisional acceptance. Under sub clause 88.8 After provisional acceptance and without prejudice to the defects liability	

		Make other arrangements to carry out the work and claim the cost against the Contractor, under Sub-Clause 2.5 or Accept the work including the defect and reduce the Contract Price, under the procedures of Sub-Clause 3.5 Terminate the Contract as a whole or in respect of the relevant part of the Works ***Clause 11.5 Removal of Defective Work*** This set out that if the defect or damage cannot be remedied expeditiously on the Site and the Employer gives consent, the Contractor may remove from the Site for the purposes of repair such items of Plant as are defective or damaged. This consent may require the Contractor to increase the amount of the Performance Security by the full replacement cost of these items, or to provide other appropriate security. ***Clause 11.6 Further Tests*** This Clause set out that if the work of remedying of any defect or damage may affect the performance of the Works, the Engineer may require the repetition of any of the tests described in the Contract. The requirement shall be made by notice within 28 days after the defect or damage is remedied. These tests shall be carried out in accordance with the terms applicable to the previous tests, except that they shall be carried out at the risk and cost of the Party liable, under Sub-Clause 11.2 [*Cost of Remedying Defects*], for the cost of the remedial work.	referred to in this GCC Clause, the Contractor shall no longer be responsible for risks which may affect the works and which result from causes not attributable to him. However, the Contractor shall be responsible as from the date of provisional acceptance for the soundness of the construction, as laid down in the in the Ethiopian law.	

		Clause 11.7 Contractor to Search This clause sets out the Contractor shall, if required by the Engineer, search for the cause of any defect, under the direction of the Engineer. Unless the defect is to be remedied at the cost of the Contractor under Sub-Clause 11.2 [*Cost of Remedying Defects*], the Cost of the search plus profit shall be agreed or determined by the Engineer in accordance with Sub-Clause 3.5 [*Determinations*] and shall be included in the Contract Price.		

5.2. Decision from the Court for the Case

As shown on the comparison table Provisions of MDB-FIDIC 2006 and FPPPAA 2011 Condition of contracts triggers that both the consultant and the contractor are responsible for the failure.

Moreover the court decision also shows that both are liable.

Liability of Consultant by Law:

- The court decides that the consultant is liable for the failure, and shall be cover all costs related to the design and supervision which is necessary for reconstruction of mentioned work.

Liability of Contractor by Law:

- The court decides that the contractor is also liable for the failure, since as a professional firm they can protect the employer by giving his value engineering mandate by giving alarm for the client and the consultant. So the court decides that the contractor shall also be share the costs related to the reconstruction of mentioned work.

Liability of Client by Law:

- The court decides that the client is liable for the lost person; since they should be enforcing the entities to take care and safety measure for the workers.

Liability of Engineer by Law:

- The engineer is asked by crime in front of court for the lost carpenter. And the legal process is continued when this case study is developed.
- Costs related compensation and life insurances are covered by the contractor's insurer.

Finally quality deviation is a serious issue as we seen in the above case study, and its regulation & liability is different by law rather than in both conditions of contracts.

Chapter Six: Conclusion and Recommendation

6.1. Conclusion

Dealing with Quality Assurance System and implemented on the part of the contract assists construction professionals, Contractors, Sub-Contractors and Suppliers in the early identification and rectification of non-conformances, is an essential risk management tool to avoid or minimize liability.

Whilst regarded as an unwelcome, costly and even risky imposition by some, Quality System should increase efficiency, reduce costs and, most importantly, reduce disputes and the incidence of liability.

Those design professionals and Contractors who view Quality System as only another way to incur costs and liability should re-appraise this view. Rather, its potential risk management benefits in reducing exposure to liability should significantly outweigh any increased risk by QA, perhaps, bench marking a standard of performance to be achieved.

Whether convinced or not of those benefits, QA cannot be ignored, as an increasing number of public and private sector clients are demanding the implementation of QA for design, documentation and construction.

Furthermore, quality consciousness implementing on the contract depending upon its terms and the detail of its requirement based on the conditions of the contract like GCC of MDB-FIDIC 2006, FPPPAA 2011 and the Technical specification can be a benchmark for standard requirement for the design professional, risk allocation on the contracting parties and obligation implementation method.

Hence, this study will indicate the future strategies and potential developments of based on the following points for Employers, Contractors, Consultants, Sub-Contractors, Project managers and company administrators on the quality consciousness in terms of TQM, Legal liability and contractual liability in the construction industry.

The economic loss by the Employer or public body due to defective works and when the building is not serving the intended economical return is significant.

Management commitment to quality and to continuous quality improvement is very important in each phase of the Construction process. Management must participate in the implementation process and be fully committed to it if TQM is to succeed.

Construction industry professionals should aware of the importance of quality training. Engineering, architecture and construction management students who eventually become the construction industry's future leaders must be instructed in the basics of quality management. Education and training in TQM theory and practice at all levels (management as well as operative levels) and in all phases (design, construction, and operation phases) are essential to enhance competitiveness.

Teamwork within the company and with the stakeholders is necessary to allow each person to get the assistance required to be successful individually, and collectively as a team. The whole construction industry is project oriented; so improved quality performance must be project-related and must include the whole project as a team. Manufacturer, subcontractors, main contractor, vendors, professional designers, project managers and above all, the owner must be involved in the process. Partnering arrangements between these parties will enhance total quality.

Taking measures to achieve high quality cost money. This cost should not be considered an expense but an investment. The level of savings through increased efficiency and in the avoidance of liability can be significantly higher.

The requirements of the owner must be clearly defined at the beginning of the project and be agreed to by the owner, design firm and Contractor. The more time and effort are spent at the beginning in defining requirements, the more smoothly the project will progress. Objective setting is important because it provides a focus for scope definition, guides the design process, controls the construction process, and influences the motivation of the project team.

Drawings and specifications received from the design are affect the quality of the construction. Drawings are the only documents given to the constructor that show the design concept, size and scope of the job. It is critical that drawings and specifications be clear, concise, and uniform. The

project must be constructible by those retained to build the project. Design professionals must be familiar with construction materials and techniques that constructors will be using in the project.

Quality concepts very useful on MDB-FIDIC 2006, FPPPAA 2011 and the applicable laws in transferring risk and liabilities

Based on this study conclude that for everybody participating in the contract it is better to include quality assurance manuals as part of the contract document due to the MDB-FIDIC 2006, FPPPAA 2011 and the Legal aspect includes the following important doctrines

The Contractor's quality assurance requirements shall not affect in any way the Contractor's other obligations under the contract.

Compliance by the Contractor with the quality assurance requirements (whether there are included or not) shall not relieve the Contractor in any way from compliance with any of the other requirements of the Contract.

The time and cost to be wasted as a result of rectifying unqualified works is huge

The Engineer and his subordinates are also contributing for quality problems by not implementing the contract documents and not discharging their responsibility in quality control and early warning rather they are engaged in identifying defects and instructing remedial measures.

The financial loss by the Contractor because of not understanding and implementing quality works especially when quality problem is encountered is huge as there is a continuous increment of cost of construction materials, manpower and fuel.

6.2. Recommendations

After analyzing quality problems discussed in the foregoing chapters; and further reviewing of various literatures on the subject matter, the researchers recommend for federal ministry of Construction and other stakeholders to undertake the following positive measures in order to alleviate the problems in time of formulating designs, construction implementation and afterward.

Capacity building and awareness creation training should be prepared for contractors and consultants about quality assurance, quality control and TQM in construction, supervision and design projects through workshops, seminars and formal studies.

The Employers shall build the capacity of the organization as well as employees through workshops, seminars and formal studies about quality assurance, quality control and TQM in construction, supervision and design projects. And establishing quality assurance directorate by recruiting well experienced and trained personal to develop quality standards, manuals and guidelines which is applicable for the administration of quality related issues in construction.

Consultants (Designers) have to furnish professional indemnity insurance for the design they produce for construction against professional fault as per the requirement of the Ethiopian Civil Code Article 2031.

The supervision consultant's quality assurance manual has to be implemented seriously and the Employer by his representative to follow regularly the effect of the same.

There must be a compelling clause on quality assurance issues in the conditions of Contract of Ethiopia like FPPPAA 2011 with a similar or better fashion as the MDB-FIDIC conditions of contract of sub-clause 4.9. The Contractor should submit and implement a quality Assurance manual and enforce quality management systems in projects based on the manual.

Both contractors and consultants should attend seriously their tasks and assignments as outlined in the contract document and the employer to ensure the same.

A contractor's in-house quality assurance system is of utmost importance; it prevents problems and their reoccurrence and allows his or her clients to relax. One of these quality system standards is the ISO 9000 standard, which has been adopted by a large number of countries around the world and is applied in various industries including engineering and construction. Hence, finally this study recommends using the ISO 9000 standard in the construction industry is better to improve mentioned problems above in our country.

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